REMARKS

This is in response to the Non-Final Office Action mailed on January 25, 2007. The Examiner has withdrawn all the previous rejections. Upon entry of the amendment, claims 1, 3-18, and 20-43 are pending in the application. Claims 21-36 and 38-42 have been withdrawn from consideration. Claim 2 has been cancelled. Claim 37 is amended herein to recite that the adhesive is curable without the application of an external energy source.

Claim Rejections Based on U.S. Patent No. 4,070,225

The Examiner rejected several claims as being anticipated by U.S. Patent No. 4,070,225 (Batdorf) or as being obvious in view of Batdorf alone or in combination with other references. For the following reasons, Applicant submits that the claims are patentable over Batdorf alone or in combination with the cited references.

A. Batdorf fails to anticipate the claims

The Examiner rejected claims 1, 3, 4, 17, and 18 under 35 U.S.C. § 102(b) as being anticipated by Batdorf. The Examiner stated that Batdorf teaches two-part, high solids curable adhesive compositions that are curable without application of an external energy source.

Applicant respectfully disagrees with the Examiner's statements. A reference fails to anticipate a claim unless the reference teaches each and every element in the claim. (MPEP § 2131.) Batdorf relates to a method for forming epoxy adhesive-bonded joints between a plurality of substrates. The adhesive system in Batdorf may include a two-part adhesive composition that may include an epoxide prepolymer and a primary-amine terminated polyamide curing agent. Batdorf, however, fails to teach an adhesive composition that is curable without the application of an external energy source. Rather, Batdorf teaches that its adhesive composition will not cure "until heat and/or pressure are applied." ('225

Patent, Abstract, lines 3-7.) The adhesive in Batdorf is unreactive until exposed to epoxide cure initiation conditions, which are attained by heating the adhesive to a temperature above the ring and ball softening point of the polyamide. ('225 Patent, column 6, lines 15-20; See also, column 2, lines 34-37.) Even the passage cited by the Examiner states that curing requires "initiation of the epoxide curing reaction" and that the adhesive continues to cure "after the initiation conditions have been removed." ('225 Patent, column 2, lines 14-22.) Thus, Batdorf explicitly requires the application of an external energy source for its adhesive to be curable. Therefore, Batdorf fails to teach or suggest a label that comprises an adhesive layer where the adhesive is curable without application of an external energy source. For at least this reason, Batdorf fails to teach every feature set forth in independent claim 1 and fails to anticipate the claims.

Batdorf also fails to teach a label or a polymer facestock. The preamble should be given patentable weight where it breathes life and meaning into the claim. (MPEP § 2111.02.) In *Kropa v. Rubie*, 187 F.2d 150, 88 USPQ 478 (CCPA 1951),[1] a preamble reciting an abrasive article "was found to further define the structure of an article comprising abrasive grains and a hardened binder." (See MPEP § 2111.02.) The court stated that only the phrase "an abrasive article" could make it "known that the subject matter defined by the claims is comprised as an abrasive article." (Id. (quoting *Kropa*).) Further, the court stated that every union of substances capable of use as abrasive grains and a binder is not an abrasive article. (Id.)

In *Union Oil Co. of Cal. v. Atlantic Richfield Co.*[2], the Federal Circuit upheld a district court's interpretation that a claim for "an embedded gasoline suitable for combustion in an automotive engine" covered fuel compositions that "will regularly be used in autos, not fuels that conceivably could be." (208 F.3d 989, 995 (Fed. Cir. 2000).) The Federal Circuit stated that the preamble language specified fuels

[1] Cited and discussed in MPEP § 2111.02.

[2] A copy of this case is attached as a courtesy to the Examiner.

for automotive engines, not aviation engines, and the reference to unleaded gasoline involves standard automotive fuels rather than specialized fuels. The specification also demonstrated that the claim related to ordinary fuels for use in passenger cars. The Federal Circuit found that the district court correctly determined the prior art specialty fuels, such as aviation and racing fuels do not anticipate the claims because they did not include the limitation of being a standard automotive fuel composition. *(Union Oil,* 208 F.3d at 996.*)* That is, not every fuel is comprised as an automotive fuel.

Analogous to the abrasive article in *Kropa* or the automotive fuel in *Union Oil*, not every construction comprising an adhesive bonded to a substrate is comprised as a label. Thus, the preamble "a label" breathes life into the present claims and should be given patentable weight. Batdorf does not teach or suggest a label or a facestock. Batdorf relates to using a bonding adhesive as a substitute for welding to bond metal substrates together. ('225 patent, column 1, lines 49-57; column 8, lines 57-59.) All the examples in Batdorf demonstrate bonding aluminum substrates together. The mere disclosure of plastics in Batdorf does not teach or suggest either a polymer facestock or a label. Not every substrate is suitable as a facestock, and not every construction with a plastic substrate constitutes a label. Therefore, Batdorf fails to teach all the limitations in claim 1 and fails to anticipate the claims.

In view of the foregoing, Applicant respectfully requests that the rejection be withdrawn.

B. The claims are not obvious in view of Batdorf alone or in combination with other references.

The Examiner rejected (i) claim 6 under 35 U.S.C. § 103(a) as being obvious over Batdorf in view of U.S. Patent No. 5,536,800 (Scholz); (ii) claims 7, 8, and 37 as obvious over Batdorf in view of U.S. Patent No. 5,863,624 (Miyazaki et al.); (iii) claim 9 as obvious in view of Batdorf; and (iv) claim 43 as being

unpatentable over Batdorf in view of U.S. Patent No. 3,723,223 (Le Compte). Applicant respectfully disagrees with the Examiner's statements.

To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference, or references when combined, must teach or suggest all the claim limitations. (MPEP § 2143.) The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on Applicant's disclosure. (Id.) The initial burden is on the examiner to provide some suggestion of the desirability of doing what the inventor has done. To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or impliedly suggest the claimed invention or the examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references. (MPEP § 706.02(j).)

As discussed above, Batdorf fails to teach or suggest all the features recited in claim 1. Specifically, Batdorf fails to teach a label with an adhesive composition that is curable without application of an external energy source. Claim 1 is also not obvious in view of Batdorf, as there is nothing to teach or suggest modifying Batdorf to provide the invention of claim 1. Any claim depending from an non-obvious independent claim is also non-obvious. (MPEP § 2143.03.) Therefore, claims 6-9 and 43, which depend from claim 1, are also not obvious in view of Batdorf.

Further, as amended, independent claim 37 recites that the adhesive is curable without the application of an external energy source. Therefore, for the reasons discussed above, claim 37 is also patentable over Batdorf.

Moreover, the secondary references cited by the Examiner do not make up for Batdorf's deficiencies. The Examiner only relies on Scholz for teaching the use of a particular adhesive coat weight. Therefore, the combination of Batdorf and Scholz fails to teach the invention of claim 6 (which includes all the limitations of claim 1).

There is no motivation to modify Batdorf with Miyazaki or Le Compte. Miyazaki teaches a thermosetting resin adhesive formed of an epoxy resin and a trimellitic acid anhydride hardener. To obtain strong adhesion of the polyester film of Miyazaki to the metal sheet, the metal sheet and polyester film are placed in an oven to cure the thermosetting resin adhesive. (See '624 patent, column 13, lines 45-51.)

Le Compte is directed to a one-component, heat curing adhesive, having a long shelf life. Le Compte discloses a carrier that is coated with a composition comprising a thermoplastic binder, discrete particles of epoxy resin, discrete particles of a heat-reactive epoxy reactive hardener, and a dispersing medium. ('223 patent, column 1, lines 31-36.) The binder is employed to reduce contact between the epoxy and the hardener particles and prevent them from reacting until heat curing during lamination. ('223 patent, column 2, lines 32-36.) Additionally, Le Compte's composition utilizes a dispersing medium (water or solvent) to decrease the concentration of reactive particles and cause the binder to surround each particle and keep it from contacting other reactive particles. (Column 2, lines 46-63.) The coated carriers may be stored for long periods of time at room temperature ('223 patent, column 4, lines 15-17.) The coated carriers are used for lamination and not as labels. Laminates are formed by hot pressing a substrate to the coated carrier, such as by inserting a coated carrier and substrate in a press at about 200°F to about 400°F at a pressure of from about 10 pounds per square inch to about 1,000 pounds per square inch. (Column 4, lines 18-34.)

Thus, as described above, Miyazaki and Le Compte also require applying an external energy source (heat) to cure their respective adhesives. Therefore,

the combination of Batdorf with Miyazaki or Le Compte fail to teach the claimed invention. It is only through prohibited hindsight in view of Applicant's disclosure that a person would combine the references to arrive at the claimed invention.

For at least these reasons, claims 6-9, 37, and 43 are not obvious in view of Batdorf either alone or in combination with the cited references, and Applicant respectfully requests that the rejections of these claims be withdrawn.

Claim Rejections based on U.S. Patent 6,248,204 (Schuft)

The Examiner rejected claims 1 and 5 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 6,248,204 to Schuft. The Examiner stated that Schuft discloses a two-part room temperature curable thermosetting epoxy adhesive composition that includes an epoxy resin as a first component, an epoxy resin hardener such as oxyethylene diamine as a second component, and has a high solids content since the composition contains no volatile solvents. The Examiner also contends that Schuft's disclosure of bonding together substrates such as phenolic composites and, therefore, discloses a polymer facestock with an adhesive layer and reads on a label.

Applicant respectfully disagrees with the Examiner's statements. As discussed above, the preamble "a label" in claim 1 breathes life into the claims, and not any construction where substrate are bonded to an adhesive is suitable as a label. Schuft does not teach or disclose a label comprising a polymer facestock. Schuft relates to an epoxy resin composition for use in aerospace applications. The resin composition includes an epoxy resin component and an epoxy resin hardener. The epoxy resin component includes an inorganic and/or organic filler component that acts as a structural reinforcement component, a thixotropy-conferring component, or an adhesion strength-conferring component. The adhesive in Schuft is a bonding adhesive used for bonding together substrates, at least one of which is constructed of a metal or a synthetic material such as glass cloth phenolics and phenolic composites. In particular, Schuft teaches the

desirability of providing adhesives that are particularly suitable for aerospace applications, such as applications to assemble the nose inlet and exit cones on, for example, the Space Shuttle, in which phenolic rings are secured to a metal housing. ('204 patent, column 1, lines 45-57.) The mere disclosure of substrates such as metal and phenolic composites does not teach either a label structure or a facestock as set forth in the claims. Therefore, claims 1 and 5 are not anticipated by Schuft. Applicant respectfully requests that the rejection be withdrawn.

Claim Rejections based on U.S. Patent 4,883,697 (Dornbusch)

The Examiner rejected several claims as being obvious over Dornbusch in view of Batdorf (and in some instances in view of additional references). The Examiner rejected claims 1, 11, 12, and 14 under 35 U.S.C. § 103(a) as being unpatentable over Dornbusch in view of Batdorf. Claim 10 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Dornbusch in view of Bartdorf, and further in view of U.S. Patent No. 4,654,262 to Alonso. Claim 13 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Dornbusch in view of Batdorf, and further in view of U.S. Patent No. 4,151,319 to Sackoff et al. Claim 15 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Dornbusch in view of Batdorf, and further in view of U.S. Patent No. 5,380,587 to Musclow. The Examiner rejected claim 16 as being unpatentable over Dornbusch in view of Batdorf, and further in view of U.S. Patent No. 6,153,288 to Shih et al.

The Examiner states that Dornbusch discloses a thermoplastic label stratum laminated to an upper surface of stress-compensating stratum via epoxy-type urethane type adhesive. The Examiner acknowledges that Dornbusch fails to teach an adhesive layer as claimed in claim 1, but the Examiner argues that it would have been obvious to use the adhesive from Batdorf. The Examiner argues that a person skilled in the art would be motivated to use Batdorf's adhesive that has a very lengthy open time and can provide a strong bond between the label stratus and stress-compensating medium.

Applicant disagrees with the Examiner's statements. Dornbusch discloses a flexible multilayer label comprising a label stratum (14) laminated to a stress-compensating stratum (30) by a one-component adhesive (20) such as an epoxy-type urethane. A heat-activated sealant is laminated to the stress-compensating stratum (30). ('697 patent, column 5, lines 2-7.) It is the heat-activated sealant in layer (25) of Dornbusch, not the adhesive (20), that provides the bonding capability to bond the label to a package. Dornbusch discloses that its heat-activated sealant is a wax composition that includes ethylene-vinyl acetate copolymer. Thus, Dornbusch fails to teach or suggest a two-part curable adhesive, let alone one comprising a curing agent comprising at least one primary amine, diamine, polyamine or mixtures of two or more thereof. As discussed above, Batdorf is directed to an adhesive that requires heat to initiate curing. Consequently, even if a person skilled in the art would be motivated to use Batdorf's adhesive in either the adhesive layer 20 or the heat-activated sealant 25 of Dornbusch, the combination of Dornbusch and Batdorf still fails to teach employing an adhesive that is curable with the application of an external energy source. Again, it is only through prohibited hindsight in view of Applicant's disclosure that a person skilled in the art would arrive at the present claims based on Dornbusch in combination with Batdorf. Therefore, the combination of Dornbusch and Batdorf fails to render claim 1 obvious.

Since claim 1 is not obvious in view of the combination of Dornbusch and Batdorf, claims 11, 12, and 14, which depend from claim 1, are also not obvious.

The additional references cited by the Examiner with respect to claims 10, 13, 15, and 16 do not make up for the deficiencies in the combination of Dornbusch and Batdorf. Therefore, claims 10, 13, 15, and 16, which depend from claim 1, are not obvious in view of the combination of Dornbusch and Batdorf even when combined with the cited references.

Applicant respectfully requests withdrawal of the rejection of claims 1 and 10-16 based on Dornbusch in combination with Batdorf alone or in further view of any of the cited references.

CONCLUSION

In view of the foregoing remarks, Applicant respectfully requests a timely issuance of a Notice of Allowance.

In the event any fees are due in connection with the filing of this document, the Commissioner is authorized to charge those fees to our Deposit Account No. 18-0988 under Attorney Docket No. **AVERP3299USA**.

Respectfully submitted,

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UNION OIL COMPANY OF CALIFORNIA, Plaintiff-Appellee,

v.

ATLANTIC RICHFIELD COMPANY, Chevron U.S.A. Inc., Exxon Corporation, Mobil Oil Corporation, Shell Oil Products Company and Texas Refining and Marketing, Inc.

No. 99-1066.

United States Court of Appeals, Federal Circuit.

March 29, 2000.

Rehearing and Rehearing En Banc Denied May 18, 2000.

Petroleum refiners brought action against patentee, seeking a declaratory judgment to invalidate patent claiming automotive gasoline compositions designed to reduce automobile tailpipe emissions. Patentee counterclaimed, alleging willful infringement. After declaratory judgment action was effectively converted into infringement defense, jury found for patentee on issues of validity, and the United States District Court for the Central District of California denied refiners' motion for judgment as a matter of law (JMOL). The District Court, 34 F.Supp.2d 1208, 34 F.Supp.2d 1222, determined that patent was not enforceable for inequitable conduct and awarded attorney fees. Refiners appealed. The Court of Appeals, Rader, Circuit Judge, held that: (1) patent claims were directed to compositions of matter and were not limited to only certain uses of those compositions; (2) patent claims were not anticipated by prior art; and (3) written description was adequate.

Affirmed.

Lourie, Circuit Judge, dissented in part and filed opinion.

1. **Federal Courts** ⇐765

Court of Appeals reviews the district court's denial of a motion for judgment as a matter of law (JMOL) after a jury verdict by reapplying the district court's own standard; thus, to prevail on appeal, the appellants must show that substantial evidence does not support the jury's factual findings or that the district court erred in applying the law.

2. **Federal Civil Procedure** ⇐2608.1

District court may overturn a jury's verdict on a motion for judgment as a matter of law (JMOL) only if, upon the record before the jury, reasonable persons could not reach the verdict returned by that jury.

3. **Federal Courts** ⇐801

In reviewing ruling on judgment as a matter of law (JMOL), Court of Appeals must consider the evidence of record in the light most favorable to the nonmovant, drawing all reasonable inferences in its favor, without disturbing the jury's credibility determinations or substituting Court's resolutions of conflicting evidence for those of the jury.

4. **Patents** ⇐62(3)

Party seeking to invalidate a patent on grounds of anticipation must show, by clear and convincing evidence, that the allegedly invalidating prior art contains each and every element of the claimed invention. 35 U.S.C.A. § 102.

5. **Patents** ⇐112.1

Issued patents enjoy a presumption of validity.

6. **Patents** ⇐324.55(4)

Court of Appeals reviews a finding that a patent was anticipated as a question of fact; therefore, on appeal, Court must affirm the district court's denial of a motion for a judgment as a matter of law seeking to establish anticipation if substantial evidence supports the jury's verdict that the cited prior art did not anticipate the claims. 35 U.S.C.A. § 102.

7. Patents ⇐324.5

First step in any analysis of alleged patent invalidity is claim construction, which is a question of law that Court of Appeals reviews without deference.

8. Patents ⇐165(3), 167(1), 168(2.1)

In patent claim construction the words of the claims are construed independent of the accused product, in light of the specification, the prosecution history, and the prior art; the construction of claims is simply a way of elaborating the normally terse claim language in order to understand and explain, but not to change, the scope of the claims.

9. Patents ⇐179

Patent claims directed to "[a]n unleaded gasoline suitable for combustion in an automotive engine" or "[a]n unleaded gasoline fuel suitable for combustion in a spark ignition automotive engine" claimed compositions of matter, so scope of claims did not embrace only certain uses of claimed compositions; if such limitation were permitted, composition claims would mutate into method claims.

10. Patents ⇐72(1)

Patent claims directed to "[a]n unleaded gasoline suitable for combustion in an automotive engine" or "[a]n unleaded gasoline fuel suitable for combustion in a spark ignition automotive engine" were limited to ordinary automotive fuel, and patent was thus not anticipated by other specialty fuels, which did not include each and every limitation of claims. 35 U.S.C.A. § 102.

11. Patents ⇐99

Where party challenges patent as having inadequate written description, the primary consideration is factual and depends on the nature of the invention and the amount of knowledge imparted to those skilled in the art by the disclosure. 35 U.S.C.A. § 112.

12. Patents ⇐324.55(4)

In reviewing district court's decision upon challenge to patent alleging inadequate written description, Court of Appeals reviews a jury's factual findings for substantial evidence. 35 U.S.C.A. § 112.

13. Patents ⇐99

Written description requirement does not require patent applicant to describe exactly the subject matter claimed, but the description must clearly allow persons of ordinary skill in the art to recognize that he or she invented what is claimed; thus, statutory requirement for written descriptions ensures that, as of the filing date, the inventor conveyed with reasonable clarity to those of skill in the art that he was in possession of the subject matter of the claims. 35 U.S.C.A. § 112.

14. Patents ⇐324.55(4)

Like the district court, Court of Appeals must accord deference to the jury findings on the adequacy of a patent's written description; Court will not substitute its judgment for that of the factfinder. 35 U.S.C.A. § 112.

15. Patents ⇐99

Written description in patent for automotive gasoline compositions designed to reduce automobile tailpipe emissions was adequate, even if specification did not describe exact chemical component of each combination that fell within ranges specified in patent claims, since description was sufficient to show one of skill in the petroleum refining art that inventor possessed the claimed invention at the time of filing. 35 U.S.C.A. § 112.

16. Patents ⇐99

Written description requirement does not require identical descriptions of claimed compounds, but it requires enough disclosure in the patent to show one of skill in this art that the inventor invented what is claimed. 35 U.S.C.A. § 112.

17. Patents ⇐97

Applicants for patents and their representatives before the Patent and Trademark Office (PTO) are subject to a duty of candor, good faith, and honesty in the

prosecution of patent applications, and a breach of this duty constitutes inequitable conduct. 37 C.F.R. § 1.56.

18. Patents ⇐97

If a court determines that a patentee has engaged in inequitable conduct, the court must consider whether, as a matter of equity, the patent should be deemed unenforceable.

19. Patents ⇐324.54, 324.55(2)

Because inequitable conduct in the prosecution of a patent is an equitable issue, Court of Appeals reviews such determinations for an abuse of discretion, and Court will not disturb the district court's factual determinations of materiality and intent without a definite and firm conviction that a mistake has been committed.

Michael V. Ciresi, Robins, Kaplan & Ciresi, L.L.P., of Minneapolis, Minnesota, argued for plaintiff-appellee. With him on the brief were Martin R. Lueck, David W. Beehler, Tracy A. Sykes, and Diane L. Simerson.

E. Edward Bruce, Covington & Burling, of Washington, DC, argued for defendants-appellants. With him on the brief was Christopher N. Sipes. Of counsel on the brief were Donald R. Dunner, and J. Michael Jakes, Finnegan, Henderson, Farabow, Garrett & Dunner, L.L.P., of Washington, DC. Also of counsel on the brief were Harry C. Marcus, and Bartholomew Verdirame, Morgan & Finnegan, L.L.P., of New York, New York.

Before MAYER, Circuit Judge, LOURIE and RADER, Circuit Judges.

Opinion for the court filed by Circuit Judge RADER. Circuit Judge LOURIE dissents in part.

RADER, Circuit Judge.

The United States District Court for the Central District of California denied the appellants' motion for Judgment as a Matter of Law (JMOL) which sought to overturn the jury verdicts of patent validity and willful infringement. *See Union Oil Co. of Cal. v. Atlantic Richfield Co.*, No. CV-95-2379-KMW, slip op. at 1 (C.D.Cal. Mar. 10, 1998) (*Unocal I*). In their JMOL motion, the Atlantic Richfield Company and other appellant refiners asserted that Union Oil Company of California's (Unocal) United States Patent No. 5,288,393 ('393 patent) is invalid under 35 U.S.C. §§ 102 and 112 (1994). The district court also held that Unocal did not commit inequitable conduct before the U.S. Patent and Trademark Office (PTO). *See Union Oil Co. of Cal. v. Atlantic Richfield Co.*, 34 F.Supp.2d 1208, 1222 (C.D.Cal.1998) (*Unocal II*). Because the appellant refiners did not show a reversible flaw in the jury's verdict, this court affirms the district court's denial of JMOL on §§ 102 and 112 issues. Similarly, this court affirms the trial court's discretionary judgment of no inequitable conduct.[1]

I.

Unocal owns the '393 patent, which claims automotive gasoline compositions that reduce automobile tailpipe emissions. Unocal's original patent application contained 82 claims. As is often the case during the course of prosecution, the inventor added and canceled many claims. Ultimately, 155 claims issued, but Unocal later disclaimed all but the forty-one at issue in this case: claims 20, 53, 54, 56, 57, 71–75, 78, 79, 81, 112–16, 117 (multiply dependent on claims 53, 73, 78, 112, 116, and 125), claim 120 (multiply dependent on claims 55, 78, 79, and 124), claim 121 (dependent on claim 120 and therefore multiply dependent on claims 55, 78, 79 or 124), 125–27, 133–35, 137, 153, and 155. Each claim appears in dependent or multiple

1. Because the appellant refiners did not question the district court's willfulness determination in their appeal, this court does not address that issue.

dependent form, and has from four to six limitations describing ranges for several of the fuel characteristics. Each claim effectively begins either with the preface "[a]n unleaded gasoline fuel suitable for combustion in an automotive engine" or "[a]n unleaded gasoline fuel suitable for combustion in a spark ignition automotive engine." As an example, Claim 117, as dependent upon claim 116, states: [2]

> 117. [An unleaded gasoline fuel suitable for combustion in an automotive engine, said fuel having a Reid Vapor pressure no greater than 7.0 psi, and a 50% D–86 distillation point no greater than 200° F., and a 90% D–86 distillation point no greater than 300° F., and a paraffin content greater than 85 volume percent, and an olefin content less than 4 volume percent] wherein the maximum 10% distillation point is 158° F (70° C.).

'393 patent, col. 24, ll. 24–27.

As illustrated above, the claims do not describe each gasoline product in terms of molecular structures or lists of ingredients. Instead, the claims specify the chemical properties of the gasolines, reflecting the way oil refiners formulate gasoline. When oil refiners formulate new gasoline products, they do so by mixing petroleum stocks. Different stocks have different properties that are known to oil refiners. The record shows that oil refiners of ordinary skill in the art change the chemical properties of gasoline by varying the proportions of different petroleum stocks. Thus the claims which define the invention in terms of various characteristics also inform those of skill in the art of the composition of the claimed gasoline fuels.

Unocal researched extensively the production of automotive gasoline with reduced combustion emissions. Unocal's scientists, Drs. Jessup and Croudace, ultimately filed a patent application based on their findings. Their research taught ways to produce cleaner gasoline by varying the following chemical properties in automotive gasolines: Reid Vapor Pressure (RVP), T10, T50, T90, Olefins, Paraffins, Aromatics,[3] and Octane.

RVP measures the partial pressure of a gasoline sample when heated to 100° F in a sealed container. *See id.* at col. 18, ll. 43–47. T10, T50 and T90 are abbreviations for percentage distillation points, as measured according to an industry standard procedure called "D–86." Each corresponds to the temperatures at which a given percentage of the gasoline sample enters a gaseous phase under specific experimental conditions. Thus, T10 is the 10% D–86 distillation point; T50 the 50% D–86 distillation point; and T90 the 90% D–86 distillation point. The olefins value describes the percentage of the gasoline comprised of olefins measured by volume. Olefins, otherwise known as alkenes, are open-chain hydrocarbons that contain at least one double bond. The paraffins value describes the percentage of the gasoline comprised of paraffins measured by volume. Paraffins, otherwise known as alkanes, are open-chain hydrocarbons that contain only single bonds. The aromatics value describes the percentage of the gasoline comprised of aromatics measured by volume. Aromatics, are compounds whose properties resemble those of 6-carbon ring molecules that have an average of three intra-ring carbon-carbon double bonds (i.e., benzene). Octane, as used in the '393 patent, describes the knocking or detonation characteristics of a gasoline sample as compared with a reference fuel. The octane value is derived by testing gasoline in a special engine under specified experimental conditions, and comparing those results to identically tested reference blends of Isooctane and n-heptane.

2. Because the claims are written in multiple dependent form, the claim elements that are incorporated from other claims have been paraphrased in brackets.

3. Although the '393 patent teaches increasing the aromatic content of automotive gasoline to reduce tailpipe emissions, the claims do not mention aromatic content.

Drs. Jessup and Croudace sought to reduce the levels of carbon monoxide (CO), nitrous oxide (NO_x), and hydrocarbons (HC) emitted from automobile tailpipes. After considerable experimentation, Drs. Jessup and Croudace discovered relationships between the various petroleum characteristics described above and tailpipe emissions. Drs. Jessup and Croudace then patented their innovative fuel compositions, describing the new compositions by their characteristics.

The specification of the '393 patent describes relationships among automotive gasoline characteristics and fuel emissions, including the following:

1. Decreasing RVP is of primary importance, and decreasing T10 and olefin content are of secondary importance for reducing NO_x emissions. *See* '393 patent, col. 2, ll. 21–29.
2. Decreasing T50 is of primary importance for reducing CO and HC emissions. *See id.* at ll. 7–11.
3. Increasing paraffin content and decreasing T50 are most effective for reducing CO emissions. *See id.* at col. 6, ll. 12–28.
4. Decreasing both olefin content and RVP are most effective for reducing NO_x emissions. *See id.* at ll. 28–31.
5. HC emissions are most practically reduced by decreasing olefins and/or T50. *See id.* at ll. 46–50.
6. Any combination of the eight characteristics can be increased or decreased as described, and that the greater any individual characteristic is changed in the directions indicated, the better the result. *See id.* at col. 15, ll. 20–28.

The specification also provides specific numerical ranges for each characteristic. For example, the specification teaches:

1. CO and HC emissions can be minimized by reducing T50 below 215° F, preferably below 195° F. *See id.* at col. 2, ll. 7–20.
2. NO_x emissions can be minimized by (a) decreasing RVP to 8.0 psi or less (preferably below 7.0 psi); (b) decreasing olefins below 15% (preferably to essentially zero); or (c) decreasing T10 below 140° F. *See id.* at ll. 21–34.
3. The best NO_x reductions are obtained when the olefins are below 15%, RVP is 7.5 psi or less, and T10 is below 140° F. *See id.* at ll. 44–50.
4. All three pollutants are reduced when T50 is 215° F or less and RVP is 8.0 psi or less, with greater reductions when olefins are below 10% or T10 is below 140° F, and still greater reductions when both olefins and T10 are reduced. *See id.* at ll. 54–64.
5. Further pollution reductions are possible when T50 is below 195° F, olefins are below 5% (preferably at essentially zero), T10 is below 120° F, and/or when RVP is below 7.0 psi. *See id.* at l. 64—col. 3, l. 3.

Elsewhere the specification describes the optimal ranges for five of the eight fuel characteristics in similar terms.

The specification also states that the gasolines are preferably unleaded, have an octane rating of at least 90, and fall most preferably within one or more of five volatility classes in American Society for Testing and Materials (ASTM) publication D4814–89 (included in Table 1 of the patent). *See id.* at col. 4, l. 66—col. 5., l. 13. Beyond the optimal ranges for individual characteristics, the '393 patent also discloses preferred fuel mixtures. In sum, the '393 disclosure describes with detail the benefits and methods of varying gasoline characteristics. The specification describes 1) the relationships among the eight individual fuel characteristics and CO, NO_x, and HC emissions, 2) characteristics most important for emissions, and 3) specific desirable ranges for RVP, T10, T50, olefins, paraffins, and aromatics.

The appellant refiners originally sued Unocal in district court, seeking a declaratory judgment to invalidate the '393 patent. Unocal counterclaimed, alleging willful infringement of the '393 patent. The district court then construed the claims of the '393 patent, effectively converting the refiners' declaratory judgment action into an infringement defense. Then the district court tried those invalidity issues to a jury. During forty-nine days of trial, the jury heard the testimony of numerous witnesses and considered hundreds of exhibits and demonstrations. *See Unocal I,* slip op. at 6. At the close of all evidence, the district court properly instructed the jury on the law, and presented the jury with a special verdict form. The verdict form required the jury to decide validity under § 102 and § 112 separately for each of the forty-one asserted claims. With respect to the § 112 questions, the trial court asked the jury to consider the '393 patent's specification, including the original claims of the application, as filed. *See Northern Telecom, Inc. v. Datapoint Corp.,* 908 F.2d 931, 938, 15 USPQ2d 1321, 1326 (Fed.Cir.1990) ("The original claims as filed are part of the patent specification."). In total, the trial court's special verdict form asked the jury 223 individual questions. After thirteen days of deliberation, the jury returned and answered affirmatively that sufficient written description supported each of the forty-one asserted claims, and that none was anticipated under § 102.

The appellant refiners then moved the district court to overturn the jury's verdict with a motion for JMOL based on anticipation, obviousness, and lack of written description. After reviewing arguments of both parties and the record, the district court found that "substantial evidence exists in the record regarding the written description to support the verdict that Drs. Jessup and Croudace had possession of the claimed subject matter." *Unocal I,* slip op. at 6. The district court similarly considered and rejected appellant refiners' arguments on anticipation and obviousness. *See id.* at 3–5.

The appellant refiners also argued that the '393 patent was unenforceable for inequitable conduct. The district court tried that issue itself and held that the refiners did not meet their burden of showing inequitable conduct by clear and convincing evidence. *See Unocal II,* 34 F.Supp.2d at 1222. The district court found the case exceptional, and therefore also awarded attorney fees to Unocal under 35 U.S.C. § 285 (1994).

The appellant refiners now appeal the district court's denial of JMOL on anticipation and written description. They also appeal the district court's inequitable conduct decision.

II.

[1] This court reviews the district court's JMOL ruling after a jury verdict by reapplying the district court's own standard. *See Applied Med. Resources Corp. v. United States Surgical Corp.,* 147 F.3d 1374, 1376, 47 USPQ2d 1289, 1290 (Fed. Cir.1998). Thus, to prevail on appeal, the appellant refiners must show that substantial evidence does not support the jury's factual findings or that the district court erred in applying the law. *See id.*

[2, 3] A district court may overturn a jury's verdict on a motion for JMOL only if, upon the record before the jury, reasonable persons could not reach the verdict returned by that jury. *See Perkin–Elmer Corp. v. Computervision Corp.,* 732 F.2d 888, 893, 221 USPQ 669, 673 (Fed.Cir. 1984). This court must consider the evidence of record in the light most favorable to Unocal, drawing all reasonable inferences in its favor, without disturbing the jury's credibility determinations or substituting this court's resolutions of conflicting evidence for those of the jury. *See Applied Med.,* 147 F.3d at 1376–77.

A.

[4, 5] This court requires that a party seeking to invalidate a patent under § 102

show that the allegedly invalidating prior art contains "each and every element of [the] claimed invention." *Lewmar Marine, Inc. v. Barient, Inc.*, 827 F.2d 744, 747, 3 USPQ2d 1766, 1767 (Fed.Cir.1987). To prevail on anticipation at trial, the refiners had to prove their case by clear and convincing evidence. *See Verdegaal Bros. v. Union Oil Co.*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1052–53 (Fed.Cir.1987). The law imposes this high burden because Unocal's patent, like any issued patent, enjoys a presumption of validity. *See id.*

[6] This court reviews a finding of anticipation as a question of fact. *See In re Graves*, 69 F.3d 1147, 1151, 36 USPQ2d 1697, 1700 (Fed.Cir.1995). Therefore, on appeal, this court must affirm the district court's denial of JMOL on anticipation if substantial evidence supports the jury's verdict that the cited prior art did not anticipate the claims.

[7, 8] "The first step in any invalidity analysis is claim construction." *See Rockwell Int'l Corp. v. United States*, 147 F.3d 1358, 1362, 47 USPQ2d 1027, 1029 (Fed.Cir.1998). Claim construction is a question of law, which this court reviews without deference. *See Georgia-Pacific Corp. v. United States Gypsum Co.*, 195 F.3d 1322, 1330, 52 USPQ2d 1590, 1597 (Fed.Cir.1999). "In claim construction the words of the claims are construed independent of the accused product, in light of the specification, the prosecution history, and the prior art.... [T]he construction of claims is simply a way of elaborating the normally terse claim language[ ] in order to understand and explain, but not to change, the scope of the claims." *Scripps Clinic v. Genentech, Inc.*, 927 F.2d 1565, 1580, 18 USPQ2d 1001, 1013 (Fed.Cir. 1991) (internal quotation marks omitted).

[9] The claims of the '393 patent recite either "[a]n unleaded gasoline suitable for combustion in an automotive engine" or "[a]n unleaded gasoline fuel suitable for combustion in a spark ignition automotive engine." Thus, the '393 patent claims compositions of matter. The scope of these composition claims cannot, as the appellant refiners argue, embrace only certain uses of that composition. *See In re Spada*, 911 F.2d 705, 708, 15 USPQ2d 1655, 1657 (Fed.Cir.1990). Otherwise these composition claims would mutate into method claims. The district court correctly applied this principle, refusing to narrow the scope of the claimed compositions to specific uses.

[10] The district court read each claim in light of the specification, and concluded that the claims cover "fuels that will *regularly* be used in autos, not that conceivably could be." *Union Oil Co. of Cal. v. Atlantic Richfield Co.*, No. CV–95–2379–KMW, slip op. at 7 (C.D.Cal. May 19, 1997) (*Unocal III*). The district court thus construed the claims to cover only a narrow class of fuel compositions, namely only standard automotive gasoline. The district court correctly excluded from claim scope a broader class of petroleum formulations such as aviation fuels or racing fuels. The claim language confirms the district court's reading of the claims to cover mass market automotive gasoline. The claim language specifies fuels for an "automotive engine," not an aviation engine. *See, e.g.*, '393 patent, col. 18, l. 65. Moreover the explicit reference to "unleaded gasoline" again invokes standard automotive fuels, rather than specialized fuels. *See, e.g., id.* at col. 18, l. 64.

The district court's interpretation also finds extensive support in the specification. The patentees described the problem that their invention addressed:

> One of the major environmental problems confronting the United States and other countries is atmospheric pollution (i.e., "smog") caused by the emission of gaseous pollutants in the exhaust gases from automobiles. This problem is especially acute in major metropolitan areas, such as Los Angeles, Calif., where the atmospheric conditions and the great number of automobiles account for aggravated air pollution.

Id. at col. 1, ll. 9–16. Similarly, the patentees describe their testing procedures and results in the specification. Specifically, the patentees used ordinary passenger automobiles in their tests. The '393 patent records the results of testing certain fuels in a 1989 Oldsmobile Calais, a 1988 Oldsmobile 98, a 1985 Ford Tempo, a 1990 Lincoln, a 1984 Chevrolet Caprice, a 1988 Honda Accord, a 1989 Ford Taurus, a 1990 Plymouth Shadow, a 1985 Chevrolet Suburban, and a 1990 Toyota Camry. *See id.* at fig. 9. None of these are aviation or racing vehicles.

Similarly, another passage provides context for the trial court's claim construction. The patentees describe their choice of test vehicles as follows:

> A total of 22 different unleaded gasoline fuels was tested in a 1988 Oldsmobile Regency 98 automobile equipped with a 3800 cc V–6 engine. This automobile was selected because it represented a high sales volume product with close to the current state-of-the-art emission technology.

Id. at col. 7, ll. 61–6. The patentees tailored their research and their patent to ordinary fuels for use in standard passenger cars. Thus, the claim language, further informed by the specification, shows that the district court correctly read the claims to cover ordinary automotive fuel.

Because the '393 patent covers only standard automotive fuel, the district court correctly determined that specialty fuels within other limitations of the claims do not anticipate under 35 U.S.C. § 102. In other words, the aviation and racing fuels that allegedly invalidate the '393 claims do not anticipate because they do not contain each and every limitation of the claims. *See Verdegaal*, 814 F.2d at 631. Specifically, this alleged prior art does not include the limitation of being a standard automotive fuel composition.

Moreover, the record does not show that the aviation and racing fuels otherwise have the claimed characteristics of the particular standard automotive fuels recited in the '393 patent. While the record shows that some properties of the aviation and racing fuels coincide with the properties of the '393 patent's claims, the record does not show the presence of each and every limitation. An expert for the refiner appellants stated that the allegedly anticipatory Phillips B–35 racing fuel "is very different from typical [automotive fuel]." Tr. at 4782. When asked, "Is Unocal unleaded racing gasoline very different from typical motor gasoline?", the expert again answered "Yes." *Id.* at 5047. This expert similarly answered "yes" when questioned about whether the asserted aviation fuels were "very different" from typical motor gasoline. *See id.* at 5060.

The district court did not err in construing the claims of the '393 patent. Furthermore the record does not show each and every element of the asserted claims of the '393 patent present in any single prior art reference. Therefore, this court affirms the district court's denial of JMOL on anticipation.

B.

[11, 12] The first paragraph of § 112 states that: "The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same." 35 U.S.C. § 112. In written description cases, "[t]he primary consideration is *factual* and depends on the nature of the invention and the amount of knowledge imparted to those skilled in the art by the disclosure." *In re Wertheim*, 541 F.2d 257, 262, 191 USPQ 90, 96 (CCPA 1976) (emphasis added). This court reviews a jury's factual findings for substantial evidence. *See B. Braun Med., Inc. v. Abbott Labs.*, 124 F.3d 1419, 1423, 43 USPQ2d 1896, 1899 (Fed. Cir. 1997).

[13] The written description requirement does not require the applicant "to describe exactly the subject matter claimed, [instead] the description must clearly allow persons of ordinary skill in the art to recognize that [he or she] invented what is claimed." *In re Gosteli*, 872 F.2d 1008, 1012, 10 USPQ2d 1614, 1618 (Fed.Cir.1989) (citations omitted). Thus, § 112, ¶ 1 ensures that, as of the filing date, the inventor conveyed with reasonable clarity to those of skill in the art that he was in possession of the subject matter of the claims. *See Vas–Cath Inc. v. Mahurkar*, 935 F.2d 1555, 1563–64, 19 USPQ2d 1111, 1117 (Fed.Cir.1991).

In the course of the lengthy jury trial, the district court heeded this court's counsel to use special verdicts in complex cases. *See Comark Communications, Inc. v. Harris Corp.*, 156 F.3d 1182, 1189 n. 1, 48 USPQ2d 1001, 1006 n. 1 (Fed.Cir.1998). The district court presented the jury with a verdict form asking it to decide separately whether each of the claims met the written description requirement. Following these instructions, the jury returned its verdict answering affirmatively forty-one separate times that sufficient written description supported each of the asserted claims.

[14] After the jury's verdict, the appellant refiners renewed their motion for JMOL to overturn the jury's verdict. *See* Fed.R.Civ.P. 50(b). The district judge then reconsidered the patent documents independently in light of all the evidence and denied the JMOL motion, thus upholding the jury's verdicts. Like the district court, this court must accord deference to the jury findings on written description. This court will not substitute its judgment for that of the fact finder. *See General Electro Music Corp. v. Samick Music Corp.*, 19 F.3d 1405, 1412, 30 USPQ2d 1149, 1155 (Fed.Cir.1994).

[15] On the record in this appeal, substantial evidence amply supports the jury's findings and the trial judge's JMOL ruling. The '393 patent teaches the effects of varying the properties of automotive gasolines to reduce harmful tailpipe emissions. In the art of gasoline production, skilled refiners obtain raw petroleum products and mix them together to achieve a desired product. Each product is the mixture of many chemicals in varying proportions. The '393 patent teaches that changes in the proportions of different hydrocarbon-containing streams mixed to produce gasoline with specific properties reduces the amount of NO_x, CO, and hydrocarbons emitted from an automobile engine. Varying one or more properties in turn effects other properties of a gasoline product. Therefore, the patent claims its inventive products in terms of ranges of chemical properties, which work in combination with ranges of other chemical properties to produce a gasoline that reduces emissions.

Appellant refiners assert that the specification does not describe the exact chemical component of each combination that falls within the range claims of the '393 patent. However, neither the Patent Act nor the case law of this court requires such detailed disclosure. *See In re Hayes Microcomputer Prods., Inc.*, 982 F.2d 1527, 1533, 25 USPQ2d 1241, 1245 ("[The applicant] does not have to describe exactly the subject matter claimed."); *Vas–Cath*, 935 F.2d at 1566 ("ranges found in applicant's claims need not correspond exactly to those disclosed in [the specification]; issue is whether one skilled in the art could derive the claimed ranges from the [ ] disclosure."). Rather, the Patent Act and this court's case law require only sufficient description to show one of skill in the refining art that the inventor possessed the claimed invention at the time of filing.

Drs. Jessup and Croudace described their invention in terms of ranges. That form of description does not offend § 112, ¶ 1. In fact, this invention lends itself to description in terms of ranges and variance of those ranges to achieve particular properties of the gasoline products. The inquiry for adequate written description

simply does not depend on a particular claim format, but rather on whether the patent's description would show those of ordinary skill in the petroleum refining art that the inventors possessed the claimed invention at the time of filing.

In this case, the patent teaches one of ordinary skill that reducing T50 progressively reduces CO and hydrocarbons; reducing olefins progressively reduces NO_x and hydrocarbons; increasing paraffins progressively reduces CO and NO_x; and so forth with several other relationships. Then the patent claims ranges for these properties that provide cleaner gasoline emissions. The Background and Abstract portions of the specification discuss thoroughly the claimed ranges and the combinations of multiple properties.

For example, the written description supporting a single claim – claim 117– follows:

Claim limitation	Support in '393 patent
T50 at ≤ 200°	Col. 14, ll. 9-15: "no greater than 210° F. . . . but **preferably . . . less than 200° F. . . .**"
RVP at ≤ 7.0 psi	Col. 14, ll. 36-40: "Reid Vapor Pressure specification of 8.0 psi . . . **even more preferably no greater than 7.0 psi** . . ."
Olefin at < 4.0 volume percent	Col. 14, ll. 23-30: "varying the olefin content, this value is generally maintained less than 15 volume percent, with decreasing values providing progressively improved results. Thus, it is contemplated that each unit reduction, e.g., to values **below . . . 4 . . . providing progressively better results**, . . ."
Paraffin at > 85 volume percent	Col. 14, ll. 49-64: "progressively increasing the paraffin content progressively decreases the CO emitted. Accordingly . . . the paraffin content would be increased to . . . and **most preferably of all above 85 volume percent**. . . ."
T90 at ≤ 300°	claimed exactly in original claim 29[4]
T10 at ≤ 158°	Col. 5, lls. 6-30: Table 1 shows maximum T10 distillation temperatures for all five volatility classes at **158 or below.**

(Emphasis added.)

The specification further guides the skilled artisan in combining the above properties: "It will also follow that one can increase or decrease any combination of the eight properties listed above, i.e., at least two, at least three, at least four, etc., of the properties can be increased or decreased in the direction indicated above, as well as all eight." '393 patent, col. 15, ll. 20–25. The record of the trial contains testimony and exhibits showing in similar terms the written description and support for each of the forty-one claims.

To reiterate, this court supplies the written description supporting another claim, claim 125, as follows:

> itself adequate 'written description' of the claimed invention. It was equally a 'written description' . . . whether located among the original claims or in the descriptive part of the specification.").

4. One of this court's predecessor courts clarified that disclosure in an originally filed claim satisfies the written description requirement. *See In re Gardner*, 480 F.2d 879, 880, 178 USPQ 149 (CCPA 1973) ("Under these circumstances, we consider the original claim in

Claim limitation	Support in '393 patent
T50 at ≤ 205°	Col. 2, ll. 17-18: "Preferred fuels have a 50% D-86 Distillation Point of 205° F. (96.1° C) or less."
RVP at ≤ 7.0 psi	Col. 14, ll. 36-40: "Reid Vapor Pressure specification of 8.0 psi . . . even more preferably no greater than 7.0 psi . . ."
Olefin at < 6.0 volume percent	Col. 14, ll. 23-30: "varying the olefin content, this value is generally maintained less than 15 volume percent, with decreasing values providing progressively improved results. Thus, it is contemplated that each unit reduction, e.g., to values below . . . 6 . . . providing progressively better results. . . ."
Paraffin at > 75 volume percent	Col. 14, ll. 49-59: "progressively increasing the paraffin content progressively decreases the CO emitted. Accordingly . . . the paraffin content would be increased to . . . [and] even more preferably above 75 volume percent. . . ."

(Emphasis added.)

Beyond this evidence from the patent itself, skilled refiners testified that the specification taught them that the inventor possessed the emission-reducing gasolines at the time of filing. For example, when questioned, Richard Stellman, an expert in the field, stated:

Q: Does the patent teach one of ordinary skill in the art such as yourself to alter two or more of the properties in a particular – in the prescribed fashion in order to affect all three of the criteria pollutants?

A: Yes, it does.

Q: And does the patent set forth values from which one of ordinary skill in the art can practice the invention?

A: Yes, it does.

Tr. at 2515.

The patent unmistakably informs skilled refiners to increase or decrease the various components to arrive at preferred combinations. In fact, the written description usually labels both preferred and most preferred levels within each range. Skilled refiners testified that they knew the composition of the claimed combinations based on this written description. Contrary to appellant refiners' arguments to this court, the record shows that refiners of ordinary skill understood and applied the '393 patent's teachings. In sum, the record shows that the inventors possessed the claimed invention at the time of filing in the assessment of those of ordinary skill in the petroleum refining art.[5] Moreover, the jury in this case reached the same conclusion as a matter of fact—a proposition that this court cannot disturb on this record which supplies substantial evidence to support that finding.

The appellant refiners attempt to rescue their written description argument by focusing on the T90 levels cited in claims 74, 81, 116, 117, and 127. Appellant refiners allege that the "specification provides no specific T90 values . . . [and that a]lthough five of the original application claims recited combinations including a T90 limitation, they bear no resemblance to the remaining claims with T90 limitations." Appellants' Br. at 46. Appellant refiners misapprehend the teachings of T90 levels. The '393

5. The dissent contends that the specification does not show that the inventors possessed the amended claims at the time of filing. In its arguments, the dissent discounts the skill in this art, which, the jury found, knows the composition of gasolines from the specification's description of characteristics. Further, the dissent discounts the jury's role in finding, as a matter of fact, that the inventor satisfied the written description requirement, preferring instead its own "findings" about the knowledge of skilled artisans and about the sufficiency of the disclosures.

patent teaches that lowering the T90 distillation point below prior art standards for automotive gasolines creates the desired effect. *See* '393 patent, col. 2, l. 1. The standards set forth in Table 1 of the '393 patent describe the ASTM standards for gasolines that have T90 distillation points between 365 and 374° F. The T90 distillation points in the originally filed claims were less than or equal to either 315 or 300° F, thus substantially lower than in the prior art gasolines. The claimed ranges of the originally filed claims are the same as those set forth in the six claims of the issued '393 patent that contain T90 limitations. In other words, the disclosure at the time of filing taught one of skill in the art that the inventors possessed the subject matter of the later claims. Even if appellant refiners' argument were correct, that analysis only addresses the validity of five claims, leaving the remaining thirty-six claims.

Appellant refiners argue that *In re Ruschig*, 54 C.C.P.A. 1551, 379 F.2d 990, 154 USPQ 118 (CCPA 1967), supports their argument. This court's predecessor discussed in *Ruschig* whether a claim for a particular pharmaceutical compound copied into a patent application for the purposes of provoking an interference was adequately supported by the written description of a class of compounds. *Ruschig* is different than this case for several reasons. First, the *Ruschig* case involved a copied claim (another inventor's claim copied into Ruschig's application), which did not find support in Ruschig's application because Ruschig had invented and disclosed a broad set of the compounds that was similar, but not entirely within the scope of the claim. Because another inventor, not Ruschig, drafted the claim at issue to fit another specification, it is not surprising that the disputed claim did not find support in Ruschig's specification, even though the inventions were similar. In this case however, the claims, although amended in the course of prosecution, were drawn to the inventions of Jessup and Croudace, who drafted the claims with support from their own specification.

Second, as this court's predecessor explained in distinguishing *Ruschig* in another case involving ranges:

> If lack of literal support alone were enough to support a rejection under § 112, then the statement of *In re Lukach* ... that "the invention claimed does not have to be described *in ipsis verbis* in order to satisfy the description requirement of § 112," is empty verbiage.

Wertheim, 541 F.2d at 265. As in this case, in *Wertheim* the asserted claims covered a range ("solids level of at least 35%"), *id.* at 258, whereas the specification disclosed a broader range ("concentrated ... until a concentration of 25 to 60% solid matter is reached"), *id.* at 262 (internal quotation marks omitted). In *Wertheim* the CCPA held that the specification supported the claimed range, even though the precise range of the claim was not repeated verbatim in the specification, as the dissent in this case would appear to require. In so holding, the court cautioned that it would "let form triumph over substance" if it allowed the written description requirement to eviscerate claims that are narrowed during prosecution, simply because the patent applicant broadly disclosed in the original patent application but then narrowed his claims during prosecution. See *id.* at 263. Additionally, *Wertheim* reiterates the often cited rule that written description questions are intensely factual, and should be dealt with on a case-by-case basis, without the application of wooden rules. *See id.* at 262. Thus, *Wertheim* fully supports the result in this case and limits the applicability of *Ruschig*.

Our predecessor court in *Ruschig* expressed concern over the extent to which the patentee relied on variables in describing structures, leading that court to explain that rather than blaze marks on trees, the patentee had simply provided the public with a forest of trees. Artisans skilled in petroleum refining, in con-

are aware of the properties of raw petroleum sources and know how to mix streams of such sources to achieve a final product with desired characteristics. Thus the patentee in this case taught the desired characteristics of the final automotive fuels, realizing that those of skill in this art know that those characteristics define the claimed products.

A closer case for assessing the facts of written description in these forty-one verdicts—one which dealt with ranges and combinations—is *Ralston Purina Co. v. Far-Mar-Co, Inc.*, 772 F.2d 1570, 1575, 227 USPQ 177, 179 (Fed.Cir.1985). In *Ralston*, a case in which this court applied the less deferential clear error standard appropriate for this court's review of bench verdicts, this court noted that the ranges in applicant's claims need not correspond exactly to those disclosed in the parent application. *See id.* at 1575. Rather, this court clarified that the issue is whether one of skill in the art could derive the claimed ranges from the parent's disclosure. *See id.; see also Vas-Cath*, 935 F.2d at 1566 (holding that the district court erred in "applying a legal standard that essentially required the drawings of the '081 design application to necessarily exclude all diameters other than those within the claimed range."). Because of the fact-sensitive nature of the written description inquiry, this court has often warned against misapplication of precedents in this area. *See Vas-Cath*, 935 F.2d at 1562 (citing *In re Driscoll*, 562 F.2d 1245, 1250, 195 USPQ 434, 438 (CCPA 1977)). This case illustrates the reason for that warning. *Ralston* governs this case.

[16] The written description requirement does not require identical descriptions of claimed compounds, but it requires enough disclosure in the patent to show one of skill in this art that the inventor "invented what is claimed." *Vas-Cath*, 935 F.2d at 1563. On this precise question the jury received many days of testimony, heard from skilled refiners, reviewed graphs and claim charts, and examined the patent documents as guided by those skilled in the art. Indeed the district court, which also heard all the evidence from those of skill in the art, stated: "[T]he Court finds that substantial evidence exists in the record regarding written description to support the verdict that Drs. Jessup and Croudace had possession of the claimed subject matter." *Unocal I*, slip op. at 6. This court agrees. Because the record shows substantial evidence of adequate written description for each claim as the jury found, this court affirms.

III.

[17–19] Applicants for U.S. patents and their representatives before the PTO are subject to a duty of candor, good faith and honesty in their prosecution of patent applications. *See* 37 C.F.R. § 1.56 (1999). "A breach of this duty constitutes inequitable conduct." *Molins PLC v. Textron, Inc.*, 48 F.3d 1172, 1178, 33 USPQ2d 1823, 1826 (Fed.Cir.1995). If a court determines that a patentee has engaged in inequitable conduct, the court must consider whether, as a matter of equity, the patent should be deemed unenforceable. *See LaBounty Mfg., Inc. v. ITC*, 958 F.2d 1066, 1070, 22 USPQ2d 1025, 1028 (Fed.Cir.1992). Because as the name suggests, inequitable conduct is an equitable issue, this court reviews such determinations for an abuse of discretion. *See Kingsdown Med. Consultants, Ltd. v. Hollister Inc.*, 863 F.2d 867, 876, 9 USPQ2d 1384, 1392 (Fed.Cir. 1988) (*en banc* in relevant part). Moreover this court will not disturb the district court's factual determinations of materiality and intent without a "definite and firm conviction that a mistake has been committed." *Id.*

In this case, the district court issued a thorough and well reasoned opinion that shows consideration of the fundamental issues of inequitable conduct. Specifically, the district court noted that the allegedly withheld test data would not have been material to the patentability of the claims.

See Molins, 48 F.3d at 1179. The district court also found no intent to deceive by withholding the disputed test records, but instead determined that Unocal acted in good faith during the prosecution. This court detects no clear error in these findings and no abuse of discretion in the district court's determination of no inequitable conduct.

IV.

Because the record contains substantial evidence to support the jury's verdicts of no anticipation and sufficient written description, this court affirms the district court's denial of JMOL. Similarly, this court affirms the district court's inequitable conduct determination.

COSTS

Each party shall bear its own costs.

AFFIRMED.

LOURIE, Circuit Judge, dissenting in part.

Because the jury's verdict that the claims are not invalid for lack of written description is not supported by substantial evidence, I would reverse the district court's denial of the motion for JMOL, hold the relevant claims to be invalid, and vacate the damages and attorney fees awarded to Unocal. Because the district court did not abuse its discretion in concluding that Unocal did not engage in inequitable conduct, I would affirm that decision. I would not reach the anticipation issue.

Unocal's '393 patent is directed to specific gasoline compositions, albeit compositions defined by ranges of properties. No matter how an invention is claimed, it must be described in the specification. The claimed compositions were not so described. The majority supports its affirmance of the denial of the JMOL using enablement reasoning. It points to the numerous references in the specification to teachings of the various ways one may obtain particular combinations of properties for the fuels. These are *general* descriptions of how to make fuel compositions, not descriptions of the *claimed* compositions. They may also constitute descriptions of *processes* for obtaining various *characteristics* of fuel compositions, but it is specific *compositions* that are claimed here, not processes. There are written descriptions of other particular compositions in the specification, but they are not written descriptions of the inventions claimed here. It is in fact undisputed that the specification discloses no distinct embodiments corresponding to any claim at issue.

The majority supports its decision in part with two charts purporting to show detailed support in the specification for claims 117 and 125. However, the description that the majority provides, with commendable thoroughness, shows the weakness of its conclusion. The claimed compositions do not appear in the specification as such. The charts were synthesized by pulling together various directions in the specification in order to constitute the claimed compositions. Note the references to different parts of the specification for the various components. The patent does not contain such complete descriptions of those compositions; they were presumably prepared after the grant of the patent for purposes of litigation by Unocal. Erroneously, they were accepted by the jury, the trial judge, and the appellate majority.

Unocal's original application contained 82 claims. During the course of prosecution, 161 claims were added and 47 canceled. Ultimately, 196 claims issued, but Unocal later disclaimed all but the 41 at issue in this case. None of these claims were in the original application; all were added by amendment.

The written description requirement ensures that, at the time a patent application is filed, the inventor has possession of the invention claimed. *See Vas-Cath v. Mah-*

hurkar, 935 F.2d 1555, 1563, 19 USPQ2d 1111, 1116 (Fed.Cir.1991). It also serves the obvious purpose of telling the public what it is that has been invented. Possession of the invention at the time of filing is best shown by a precise description in the text of the patent specification of all of the aspects of the claimed invention. It is well-established that each claim in a patent constitutes a separate invention, *see, e.g., Jones v. Hardy*, 727 F.2d 1524, 1528, 220 USPQ 1021, 1024 (Fed.Cir.1984); thus, a written description of the invention of each claim as such must be provided if the statutory requirement is to be met as to that claim.

It is true that a patent need not describe the claimed subject matter in precisely the same terms as used in the claims, *see Vas-Cath*, 935 F.2d at 1563–64, 19 USPQ2d at 1116; however, it must still describe the invention with all its claimed limitations in some manner, *see Lockwood v. American Airlines, Inc.*, 107 F.3d 1565, 1572, 41 USPQ2d 1961, 1966 (Fed.Cir.1997); *In re Wertheim*, 541 F.2d 257, 262, 191 USPQ 90, 96 (CCPA 1979). "Precisely how close the original description must come to comply with § 112 must be left to case-by-case development." *Vas-Cath*, 935 F.2d at 1561, 19 USPQ2d at 1116 (citing *In re Smith*, 59 C.C.P.A. 1025, 458 F.2d 1389, 1395, 173 USPQ 679, 683 (CCPA 1972)).

It is clear beyond peradventure that there is no written description of any of the claimed compositions as such. There surely is a description of most of the particular *claim limitations* of the various claims, but that is not the same as a description of a *specific composition* described by a particular selection of those characteristics. If the written description does not use precisely the same terms used in a claim, the question then is whether the specification directs or guides one skilled in the art to the subject matter claimed. *See, e.g., Fujikawa v. Wattanasin*, 93 F.3d 1559, 1570, 39 USPQ2d 1895, 1904 (Fed.Cir.1996). One of our predecessor courts analogized the requirement that the written description direct one to the claimed subject matter to "blaze marks" on specific trees that mark a trail through a forest. *See In re Ruschig*, 54 C.C.P.A. 1551, 379 F.2d 990, 994–95, 154 USPQ 118, 122 (CCPA 1967). It found that a broad generic disclosure failed to constitute a description of a specific claimed compound. We have subsequently stated that without such specific direction, a general disclosure will not be sufficient to support narrowly claimed subject matter. *See Fujikawa*, 93 F.3d at 1571, 39 USPQ2d at 1905 ("In the absence of [ ] blazemarks [that the claimed compounds were of special interest], simply describing a large genus of compounds is not sufficient to satisfy the written description requirement as to particular species or subgenuses."). That direction must be expressed in "full, clear, concise, and exact" language. *See Fields v. Conover*, 58 C.C.P.A. 1366, 443 F.2d 1386, 1391, 170 USPQ 276, 280 (CCPA 1971); *In re Ahlbrecht*, 58 C.C.P.A. 848, 435 F.2d 908, 911, 168 USPQ 293, 296 (CCPA 1971); *Ruschig*, 379 F.2d at 996, 154 USPQ at 123.

Each of the claims at issue here recites a fuel having a specific combination of different fuel characteristics. Although the specification separately describes most of the individual characteristics of the combinations, it is undisputed that none of the claims at issue is matched in the specification by the combination of characteristics required by that claim. A reasonable juror could not find that the application shows possession of those combinations of characteristics by blazing a clear trail to them.

Unocal points to descriptions of individual fuel characteristics at column 14 of the specification, as well as to the prosecution history. However, column 14 simply outlines the range of variation of T10 and T50, olefin content, and RVP in order to obtain emission reductions. This is an enablement disclosure, not a description of particularly claimed compositions. Describing these individual fuel characteristics in broad terms is not the same as describing

an invention reciting specific combinations of fuel characteristics. The question is not whether each of the claim limitations finds support in the specification but whether the inventions claimed, fuels having *specific combinations of characteristics*, finds such support. The simple direction to adjust more than one fuel characteristic at a time does not direct one to, and thus does not show possession of, any of the claimed combinations of fuel characteristics. One must pick and choose among eight different types of fuel characteristics, broadly described, in order to arrive at any of the claimed combinations.

For example, as indicated earlier, to arrive at one of the combinations described in claim 117, Unocal had to pick through the specification to find the claimed limitations. Four of the limitations—the T50, RVP, olefin, and paraffin limitations—fell within ranges *broadly described*, but there is no direction to a composition having all of these limitations in the *particular ranges claimed*. Furthermore, no specific T90 ranges are described anywhere in the specification except in Table 1, which recites only certain general ASTM standards. Unocal had to point to an original, canceled claim to support the T90 value chosen, but that characteristic was part of a composition no longer claimed and no longer part of the specification. Lastly, the specification repeatedly describes fuels with a T10 less than 140° F, but the claim recites a fuel with a maximum T10 of 158° F. The specification's only recitation of a fuel with a T10 of 158° F is one of the ASTM standards in Table 1, not a part of a described embodiment of the invention. By picking and choosing, one can thus find all of the limitations, but the specification gives no direction, let alone the "full, clear, concise, and exact" direction required, to the claimed combination. The same picking and choosing is required to arrive at all of the claims asserted. When one has to pick and choose among a wide range of variables to construct a claim, the subject matter of that claim has not been described as required by the statute; possession has not been demonstrated.

Unocal makes numerous references to what the specification teaches. It does so by referring to general descriptions of the possible variables. The specification does in fact contain a written description of methods for lowering auto emissions. It also teaches how to make various *types* of compositions and methods, but does not contain a written description of the *specifically claimed* compositions. It is well settled that the enablement requirement is separate and distinct from the written description requirement of § 112, ¶ 1, *see Vas-Cath*, 935 F.2d at 1563, 19 USPQ2d at 1117, and that a specification may enable one skilled in the art to make and use an invention and yet still not describe it, *see id.* at 1562, 935 F.2d 1555, 19 USPQ2d at 1115. Whether the specification fulfills the enablement requirement by teaching how to make the claimed combinations is not before us; the fact remains that it does not describe any one of the claimed compositions. In fact, the extensive recitation of differing ranges and preferences for particular characteristics is in stark contrast to the lack of any specific description of a composition, particularly a composition set forth in the current claims.

Unocal's reference to the broad ranges of the characteristics of the various gasolines also may be an adequate written description of a generic group of gasolines defined broadly by those characteristics. However, such a generic claim is not before us. We only have claims defining compositions by a specific set of claim limitations, none of which compositions finds a specific description in the patent specification. In *Ruschig*, the Court of Customs and Patent Appeals held that a general formula containing variables that each include a number of possible groups does not describe each composition within its scope. The court stated that "[s]pecific claims to single compounds require reasonably specific supporting disclosure...." *Ruschig*, 379 F.2d at 994, 154 USPQ at

122. The same applies to the specific compositions here. The court in *Ruschig* found certain alleged "guides" in the specification inadequate, stating that "we are looking for blaze marks which single out particular trees. We see none." *Id.* at 995, 54 C.C.P.A. 1551, 379 F.2d 990, 154 USPQ at 122. The court distinguished the written description requirement from enablement, which it considered might have been satisfied by the specification. *See id.* *Ruschig* is directly pertinent to the present case, and the fact that Unocal's patent claims multiple species of compositions in no way lessens the force of *Ruschig* as relevant precedent here. Each of the claims in the '393 patent suffers from the same defect.

Attempting to distinguish *Ruschig*, the majority asserts that this is a *Ralston Purina* case, but the *Ralston Purina* opinion itself states that written description cases must be decided on a case-by-case basis. *See Ralston Purina Co. v. Far-Mar-Co, Inc.*, 772 F.2d 1570, 1575, 227 USPQ 177, 179 (Fed.Cir.1985). In finding satisfaction of that requirement, it distinguishes a number of cases in which the requirement was not met "due to a number of different factors." *See id.* The case-by-case analysis advocated in *Ralston Purina* leads in this case to the reality that the requirement has not been satisfied.

I recognize that this is a jury trial and that the written description requirement is a question of fact concerning which we owe considerable deference. However, jury verdicts are not irreversible if substantial evidence is lacking. Substantial evidence is that minimum quantum of evidence from which a reasonable jury might afford relief. *See Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 249–50, 106 S.Ct. 2505, 91 L.Ed.2d 202 (1986) (holding that "merely colorable" or "not significantly probative" evidence is insufficient to meet the substantial evidence standard); *Consolidated Edison Co. v. NLRB*, 305 U.S. 197, 229, 59 S.Ct. 206, 83 L.Ed. 126 (1938) ("Substantial evidence is more than a mere scintilla. It means such relevant evidence as a reasonable mind might accept as adequate to support a conclusion."). If a reasonable jury could not have found the facts necessary to support a verdict, the trial judge or reviewing court should reverse.

This is a highly complicated case, involving a patent that is difficult to fathom. One needs to analyze these claims the way one plans a trip, with a road map, in detail, on paper. Multiple claim dependencies and multiple claim limitations make the task difficult. The complexity of the case is further increased by the way in which the patent application was prosecuted, with wholesale cancellation and addition of claims seemingly irrespective of whether their subject matter was properly disclosed. It is easy to see how one could go astray.

A reasonable juror is one who has done his or her homework, as described above, in order to determine what each claim covers, and where in the specification there is support for such claims. The result here speaks for itself. When such analysis is performed here, it is plain that the claimed compositions are not described in the patent. No reasonable jury, carefully reading and examining the patent specification, could conclude otherwise, *i.e.*, that the patent specification's descriptions of individual fuel characteristics or the teachings that multiple fuel characteristics can be varied in particular ways constitutes a sufficient written description of the compositions of any of the claims. I therefore respectfully dissent from the conclusion of the majority that the claims have not been shown to be invalid.